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Abstract

In this paper new concept of a solution for a non-cooperative game under uncertainty is formalized. It is based on the next concepts: the vector-valued saddle point (from the theory of the multicriteria problems under uncertainty); the Nash equilibrium situation (from the game theory); the "regret" function. In the theory of the multicriteria problems under uncertainty the basic concept is the principle of guaranteed result which is directed to the possibility of realization of the "worse" uncertainty. However we can use the other concepts of optimality which take into account the possibility of realization of the favorable uncertainty.

Abstract

In this paper we make an attempt to survey the results in the theory of differential games concerning the problem of avoidance the terminal set starting from any initial position on the half-infinite interval of time.

This paper is devoted to the conditions of solvability for the problem, in certain sense dual to the global problem of pursuit. It appears reasonable to call it the global problem of avoidance (escape). This problem is closely related to the collission avoidance problem and its solvability means that from any initial position the game can be terminated in favour of the evader that is all trajectories of the conflict controlled process will be avoided the terminal set on the half-infinite interval of time (the whole phase space appears as the domain of priority for the evader).

The paper involves results concerning the problem of escape both in the cases of a single pursuer and a group of pursuers. The case of a group interaction is also treated here. Despite a specific nature of this problem a number of examples falls into its pattern.

Abstract

A following combinatorial game is considered: there are n objects of sizes $a_1, \ldots, a_n$ and m bins of sizes $b_1, \ldots, b_m$, where we assume that each object i fits into any bin j, i. e. $a_i \leq b_j$ for all i and all j.

The time consistency of Shapley value is investigated. For the cases of time inconsistent Shapley value the "regularization" of characteristic function (c. f.) — $\bar{V}(S)$ — is proposed. It is shown that the Shapley value defined for the regularized c. f. is time consistent.

Abstract

For pursuit-evasion games played on 1-skeletons of regular polyhedrons some problems of finding the minimum number of pursuers needed for the capture (in various senses) of the mobile invisible evader are considered. The results obtained for these graphs are consequences of fundamental theorems in the theory of graph searching developed by authors Fomin (1997), Golovach (1990), Petrov (1996).

Abstract

In the paper we consider the assembly line balancing (ALB) problem, that rests on grouping of assembly operations in admissible subsets, which form work places at the assembly line. We present a game-theoretical model of the ALB problem and the prospect of game-theoretical process description of multi-stage allocation to work places. We show a game-theoretical approach to dynamical hierarchical systems analysis and introduce an hierarchical model of ALB problem in the form of dynamic n-person game with coalitions. We also solve an example of game-theoretical representation of simple ALB problem without additional constraints.

Abstract

In current paper we present the problem of theoretical analysis of voting using cyclic multistage game with complete information. We consider a problem of election a board of the concern which consists of n independent companies. It is supposed that each company may suggest the set of candidates to take part in the vote for the board. And the problem statement is how the voters have to vote and what the optimal membership in the board is. In the paper simultaneous n-person voting game and algorithm of constructing the multistage voting game are formulated. For simultaneous n-person case it was proved that for different minimal admissible coalitions different Nash equilibrium can be received. For the cyclic multistage case the subgame perfect Nash equilibrium is found and the Nash equilibrium strategies are represented with the help of flow chart.

Abstract

In this paper we present a reexamination of the strong time consistency concept in n-person extensive game with perfect and imperfect information. As a result of this reexamination we offer a refinement of this property, the concept of Dynamical Compatibility, and examine the dynamical compatibility and time consistency of such optimality principles as Nash equilibria, Pareto efficiency and their refinements. We believe the dynamical compatibility is

- the desirable property of optimality principles
- an approach to the refinement of optimal sets.

Using this concept we offer new Nash equilibria refinement and prove the time consistency of this optimality principle. In addition, we have shown that the well-known sufficient conditions providing that the finite n-person extensive game with complete information possesses a unique (in payoffs' sense) subgame perfect equilibrium are actually too strong. We offer new sufficient conditions and prove the uniqueness theorem. Under the same conditions the corresponding game in normal form has an iterated dominant strategy equilibrium and the unique optimal payoffs' vector can be defined by using the backwards induction procedure. An investigation of some subgame perfect equilibriums of special type in 2-person extensive games with perfect information completes the paper.

Abstract

In the paper two person Hi-Lo stud and draw poker are considered. The optimal strategies are obtained. The asymptotic analysis of the strategies is given.

Abstract

Two-person non-zero-sum differential games are considered. The analysis is restricted to Pareto payoffs that satisfy a (global) individual rationality condition (admissible Pareto payoffs). This restriction does not guarantee that the individual rationality property will be satisfied at any intermediate time instant since one player may gain by switching to a noncooperative strategy. The allocation mechanism of the Pareto payoffs insuring time consistency is developed. Then, by introducing a payoff distribution procedure, the author changes the way of payments along the Pareto optimal trajectory to achieve and guarantee an agreeable solution. Regularized weak Pareto optimal trajectories are introduced to cope with cases where nonnegative Pareto distribution payoffs are required.

Abstract

A class of conflict-controlled processes with additional ("phase" type) restrictions on the state of the evader is considered. The boundary of the "phase" restrictions is not a "deathline" for the evader. Sufficient conditions for the sollvability of the pursuit and evasion problems are obtained, which complement a range of well-known results.

Abstract

It was found out in the problems of group pursuit, in particular in the non zero-sum game of simple pursuit with several evaders (each aiming his own interests) and one pursuer, that there exists an infinite set of Nash equilibriums (L. A. Petrosjan, V. D. Shirjaev [1986]). It turned out that the player P (the pursuer) is able to force the evaders to behave in an extremely disadvantageous way by means of the threat of changing the pursuit order. The different Nash equilibria with this property are considered.

Abstract

In the paper the non-cooperative n-players game under uncertainty is considered. In the game noises, perturbations, errors of measurements and other kinds of arise about which only the boundaries of their changes are known. The goal of player is to choose his own strategy, taking into account any uncertainty such that his payoff will be stable (in that or other playing sense). Here two approaches are used to formalize solution concepts in the game under consideration. The first approach represent the analog of saddle point for zerosum game. The second approach modifies the concept vectorvalued maximin. The paper presents several extensions of the equilibrium concept, such as the definition of guaranteeing Bequilibrium is proposed. The concepts of guaranteed Bequilibrium and UBSE are also developed for the strictly convex games which are extracted from the class of the non-cooperative n-players games. The algorithm of the construction the unimprovable Bequilibrium by Slater (UBSE) for the strictly convex games is proposed.

Abstract

Routings of different communicating pairs of subscribers depend one from another. Thus, it is not obvious that all net subscribers can be satisfied simultaneously and even if it is possible the problem is how to find the solution. Messaging increases load and lengthens corresponding lines. It enlarges cross-network delay worsening routings of those pairs who share the same lines. Routing of the whole network is called to be equilibrious if every communicating pair sends messages along optimal routes. The main result of this paper is that in ring networks there is a unique equilibrious routing.

Abstract

A new solution concept called an extended prenucleolus is defined for TU games. Characterizations of their solution in terms of balancedness as well as in terms of Pareto optimality and the reduced-game property are given. The main theorem gives an axiomatic characterization of the extended prenucleolus. It is shown further that these axioms are independent.

Abstract

This paper develops a differential game model of common-pool resource extraction. There no lease tenure which means that the game will end when all extractable deposits are extracted. Hence we have an isoperimetric game problem. A FNE solution of the game is derived. The firms' value functions, a set of state-dependent FNE strategies and the game equilibrium resource stock dynamics are provided. An efficiency analysis is given.

Abstract

Perturbations, noises, errors of measurements and other kinds of uncertainties are present in the real game problems. This paper reviews studies of non-cooperative games under uncertainty. The concept of vector guarantee plays a main part in the formalization of the game solution. Two approaches are considered: the analog of vector saddle point and the analog of vector maximin. These two variants of solution are applied in case of studying Nash equilibrium under uncertainty, Berge equilibrium under uncertainty and equilibrium of threats and counterthreats under uncertainty.